Reference = ABLIKIM 15S; PRL 115 011803
Verifier code = BES3

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis co-ordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Xiao-Rui Lyu

EMAIL: xiaorui@ucas.ac.cn

July 21, 2016

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Simon Eidelman
BINP, Budker Inst. of Nuclear Physics
Prospekt Lavrent'eva 11
RU-630090 Novosibirsk
Russian Federation

EMAIL: simon.eidelman@cern.ch

$c\bar{c}$ MESONS

NODE=MXXX025

NODE=M212

$\psi(3823)$ was $X(3823)$,

$J^{PC} = 2^{--}$
J, P need confirmation.

Seen by BHARDWAJ 13 in $B \to \chi_{c1}\gamma K$ and ABLIKIM 15S in $e^+e^- \to \pi^+\pi^-\gamma\chi_{c1}$ decays as a narrow peak in the invariant mass distribution of the $\chi_{c1}\gamma$ system. Properties consistent with the $\psi_2(1^3D_2)$ $c\bar{c}$ state.

NODE=M212

$\psi(3823)$ MASS

NODE=M212M

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
3822.2±1.2 OUR AVERAGE					
YOUR DATA 3821.7±1.3±0.7	19 ± 5	[1] ABLIKIM	15S	BES3	$e^+e^- \to \pi^+\pi^-\chi_{c1}\gamma$
3823.1±1.8±0.7	33 ± 10	[2] BHARDWAJ	13	BELL	$B \to \chi_{c1}\gamma K$

NODE=M212M

YOUR NOTE [1] From a simultaneous unbinned maximum likelihood fit of $e^+e^- \to \pi^+\pi^-\chi_{c1}\gamma$ data (the $\pi^+\pi^-$ recoil mass) taken at $\sqrt{s}$ values of 4.23, 4.26, 4.36, 4.42, and 4.60 GeV to simulated events including both $\psi(2S) \to \chi_{c1}\gamma$ and $\psi(3823) \to \chi_{c1}\gamma$ together, with floating mass scale offset for $\psi(2S)$, floating $\psi(3823)$ mass, and zero $\psi(3823)$ width, resulting in a significance of 5.9σ when including systematic uncertainties.

NODE=M212M;LINKAGE=B

[2] From a simultaneous fit to $B^\pm \to (\chi_{c1}\gamma)K^\pm$ and $B^0 \to (\chi_{c1}\gamma)K^0_S$ with significance 4.0σ including systematics. Corrected for the measured $\psi(2S)$ mass using $B \to \psi(2S)K \to (\gamma\chi_{c1})K$ decays.

NODE=M212M;LINKAGE=A

$\psi(3823)$ WIDTH

NODE=M212W

VALUE (MeV)	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA **<16**	90	[1] ABLIKIM	15S	BES3	$e^+e^- \to \pi^+\pi^-\chi_{c1}\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<24	90	[2] BHARDWAJ	13	BELL	$B \to \chi_{c1}\gamma K$

NODE=M212W

YOUR NOTE [1] From a fit of $e^+e^- \to \pi^+\pi^-\chi_{c1}\gamma$ data (the $\pi^+\pi^-$ recoil mass) taken at $\sqrt{s}$ values of 4.23, 4.26, 4.36, 4.42, and 4.60 GeV to a Breit-Wigner function with the mass fixed from the likelihood fit above, Gaussian resolution smearing, and floating width.

NODE=M212W;LINKAGE=B

[2] From a simultaneous fit to $B^\pm \to (\chi_{c1}\gamma)K^\pm$ and $B^0 \to (\chi_{c1}\gamma)K^0_S$ with significance 4.0σ including systematics.

NODE=M212W;LINKAGE=A

$\psi(3823)$ BRANCHING RATIOS

NODE=M212225

$\Gamma(\chi_{c2}\gamma)/\Gamma_{\text{total}}$ Γ_2/Γ

NODE=M212R02

VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA not seen	[1] ABLIKIM	15S	BES3	$e^+e^- \to \pi^+\pi^-\chi_{c2}\gamma$
not seen	[2] BHARDWAJ	13	BELL	$B^+ \to \chi_{c2}\gamma K^+$

NODE=M212R02

YOUR NOTE [1] From a simultaneous unbinned maximum likelihood fit of $e^+e^- \to \pi^+\pi^-\chi_{c2}\gamma$ data (the $\pi^+\pi^-$ recoil mass) taken at $\sqrt{s}$ values of 4.23, 4.26, 4.36, 4.42, and 4.60 GeV to simulated events including both $\psi(2S) \to \chi_{c2}\gamma$ and $\psi(3823) \to \chi_{c2}\gamma$ together, with floating mass scale offset for $\psi(2S)$, $\psi(3823)$ mass floating (fixed to that above), and zero $\psi(3823)$ width.

NODE=M212R02;LINKAGE=B

[2] Reported $B(B^\pm \to \psi(3823)K^\pm) \times B(\psi(3823) \to \gamma\chi_{c2}) < 3.6 \times 10^{-6}$ at 90% CL.

NODE=M212R02;LINKAGE=A

$\Gamma(\chi_{c2}\gamma)/\Gamma(\chi_{c1}\gamma)$ Γ_2/Γ_1

NODE=M212R03

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.41	90	BHARDWAJ 13	BELL	$B^+ \to \chi_{c1/c2}\gamma K^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
YOUR DATA <0.42	90	[1] ABLIKIM 15S	BES3	$e^+e^- \to \pi^+\pi^-\chi_{c1}\gamma$

NODE=M212R03

YOUR NOTE [1] From a simultaneous unbinned maximum likelihood fit of $e^+e^- \to \pi^+\pi^-\chi_{c1(2)}\gamma$ data (the $\pi^+\pi^-$ recoil mass) taken at $\sqrt{s}$ values of 4.23, 4.26, 4.36, 4.42, and 4.60 GeV to simulated events including both $\psi(2S) \to \chi_{c1(2)}\gamma$ and $\psi(3823) \to \chi_{c1(2)}\gamma$ together, with floating mass scale offset for $\psi(2S)$, $\psi(3823)$ mass floating (fixed to that above), and zero $\psi(3823)$ width.

NODE=M212R03;LINKAGE=A

$\psi(3823)$ REFERENCES

NODE=M212

YOUR PAPER	ABLIKIM	15S	PRL 115 011803	M. Ablikim *et al.*	(BES III Collab.)	REFID=56784
	BHARDWAJ	13	PRL 111 032001	V. Bhardwaj *et al.*	(BELLE Collab.)	REFID=55412

NODE=M181

$X(4360)$

$I^G(J^{PC}) = ?^?(1^{--})$

Seen in radiative return from e^+e^- collisions at $\sqrt{s} = 9.54$–10.58 GeV by AUBERT 07S, WANG 07D, and LEES 14F. See also the review under the $X(3872)$ particle listings. (See the index for the page number.)

NODE=M181

$X(4360)$ BRANCHING RATIOS

NODE=M181225

$\Gamma(\psi(3823)\pi^+\pi^-)/\Gamma_{total}$ **Γ_3/Γ**

NODE=M181R03
NODE=M181R03

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
YOUR DATA **possibly seen**	19	[1] ABLIKIM	15S	BES3	$e^+e^- \to \pi^+\pi^-\chi_{c1}\gamma$

YOUR NOTE [1] From a fit of $e^+e^- \to \pi^+\pi^-\psi(3823)$, $\psi(3823) \to \chi_{c1}\gamma$ cross sections taken at $\sqrt{s}$ values of 4.23, 4.26, 4.36, 4.42, and 4.60 GeV to the $X(4360)$ line shape.

NODE=M181R03;LINKAGE=A

$X(4360)$ REFERENCES

NODE=M181

YOUR PAPER	ABLIKIM	15S	PRL 115 011803	M. Ablikim *et al.*	(BES III Collab.)	REFID=56784
	LEES	14F	PR D89 111103	J.P. Lees *et al.*	(BABAR Collab.)	REFID=55938
	AUBERT	07S	PRL 98 212001	B. Aubert *et al.*	(BABAR Collab.)	REFID=51724
	WANG	07D	PRL 99 142002	X.L. Wang *et al.*	(BELLE Collab.)	REFID=51959

NODE=M073

$\psi(4415)$

$I^G(J^{PC}) = 0^-(1^{--})$

$\psi(4415)$ BRANCHING RATIOS

NODE=M073225

$\Gamma(\psi(3823)\pi^+\pi^-)/\Gamma_{total}$ **Γ_{17}/Γ**

NODE=M073R13
NODE=M073R13

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
YOUR DATA **possibly seen**	19	[20] ABLIKIM	15S	BES3	$e^+e^- \to \pi^+\pi^-\chi_{c1}\gamma$

YOUR NOTE [20] From a fit of $e^+e^- \to \pi^+\pi^-\psi(3823)$, $\psi(3823) \to \chi_{c1}\gamma$ cross sections taken at $\sqrt{s}$ values of 4.23, 4.26, 4.36, 4.42, and 4.60 GeV to the $\psi(4415)$ line shape.

NODE=M073R13;LINKAGE=A

$\psi(4415)$ REFERENCES

NODE=M073

YOUR PAPER	ABLIKIM	15S	PRL 115 011803	M. Ablikim *et al.*	(BES III Collab.)	REFID=56784